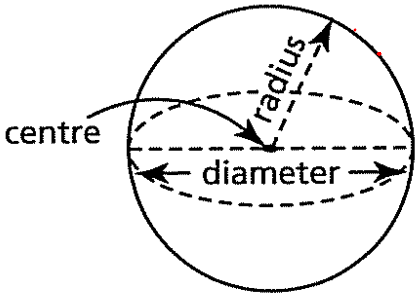
Name: _____ *Math 10F&LPC H.* **Date:** _____

Chapter 1 Measurement

1.6 Surface Area and Volume of a Sphere

A sphere is the set of points in space that are the same distance from a fixed point, which is the center. A line segment that joins the center to any point on the sphere is the radius. A line segment that joins the two points on a sphere and passes through the center is a diameter.

http://www.youtube.com/watch?v=Bcz4vGvoxQA



Google
- radius =
- speed of sound =
- speed of light =

You need to calculate, How long for the sound & light takes to travel around the earth?

surface area is the total area of the surface of an object, where volume is the amount of space occupied by an object.

Complete the "Construct Understanding" on page 45-46 to determine the formula for the surface area of a sphere.

- Area of a Circle = πr^2 where r = radius
- How many circles did you fill with orange peel: _____

We can use the formula for the surface area of a sphere to develop a formula for the volume of a sphere. This is demonstrated on page 48.

Surface Area of a Sphere	Volume of a Sphere
$SA = 4\pi r^2$ 	$V = \frac{4}{3}\pi r^3$ 
r = radius $r = \frac{d}{2}$	$= \frac{4}{3}\pi\left(\frac{d}{2}\right)^3$
$SA = 4\pi\left(\frac{d}{2}\right)^2 = 4\pi\frac{d^2}{4}$	$= \frac{4}{3}\pi\frac{d^3}{8} = \frac{1}{6}\pi d^3$
$SA = \pi d^2$	

***Example 1*:** The diameter of a baseball is approximately 3 in. Determine the surface area of the baseball to the nearest square inch.

$d = 3$ in

$r = \frac{3}{2}$ in

(a) $SA = 4\pi r^2$

$= 4(3.14)\left(\frac{3}{2}\right)^2$

$= 28.27 \text{ in}^2$

$= \boxed{28 \text{ in}^2}$

(b) $V = \frac{4}{3}\pi r^3$

$V = \frac{4}{3}(3.14)\left(\frac{3}{2}\right)^3$

$V = 14.13 \text{ in}^3$

$= \boxed{14 \text{ in}^3}$

***Example 2*:** The surface area of a lacrosse ball is approximately 20 square inches. What is the diameter of the lacrosse ball to the nearest tenth of an inch?

$SA = 20 \text{ in}^2$

$d = ?$

$SA = \pi d^2$

$20 = 3.14\, d^2$

$d^2 = 6.639$

$d = \sqrt{6.639} = 2.52$

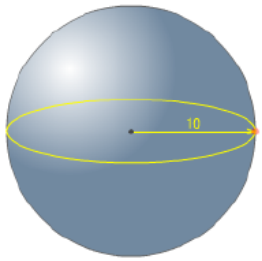
$\simeq \boxed{2.5 \text{ in}}$

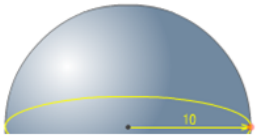
$SA = \pi d^2$ ✓

$d^2 = \frac{SA}{\pi}$

$d = \sqrt{\frac{SA}{\pi}}$

$= \sqrt{\frac{20}{3.14}} = \boxed{2.5 \text{ in}}$





When a sphere is cut in half, two hemispheres are formed.

SA of Hemisphere $= \frac{4\pi r^2}{2} + \pi r^2 = 2\pi r^2 + \pi r^2 = \boxed{3\pi r^2}$

V of $= \frac{4}{3}\pi r^2 / 2 = \boxed{\frac{2}{3}\pi r^3}$

***Example3*:** The sun approximates a sphere with diameter 870000 mi. What is the approximate volume of the sun?

$d = 8.7 \times 10^5$ mi

$V = \frac{4}{3}\pi r^3$

$= \frac{1}{6}\pi d^3$

$= \frac{1}{6}(3.14)(8.7 \times 10^5 \text{ mi})^3$

$= \boxed{3.446 \times 10^{17} \text{ mi}^3}$

2.6×10^{29} mi^3

~~3.45×10^{17} mi^3~~

S.N

***Example 4*:** A hemisphere has a radius 8.0 cm.

a) What is the surface area of the hemisphere to the nearest tenth of a square centimetre?
b) What is the volume of the hemisphere to the nearest hundredth of a cubic centimetre?

$r = 8.0$ cm

(a) $SA = 3\pi r^2$

$= 3(3.14)(8.0)^2 = 603.19$

$\simeq \boxed{603.2 \text{ cm}^2}$

(b) $V = \frac{2}{3}\pi r^3$

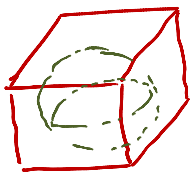
$= \frac{2}{3}(3.14)(8.0)^3 = \boxed{1071.8 \text{ cm}^3}$

Try: A spherical Christmas ornament measures 12 cm in circumference. What is the approximate volume of the cubed box that will hold this ornament?

$C = 12$

$C = 2\pi r$ or $= \pi d$

$d = \frac{C}{\pi} = \left(\frac{12}{\pi}\right)$ = side of cube



$V_{cube} = s^3 = \left(\frac{12}{\pi}\right)^3 = \boxed{55.73 \text{ cm}^3}$

Try: The radius of a sphere is tripled. How many times larger is the volume of the

new sphere?

radius = r

$V_1 = \frac{4}{3}\pi r^3$

radius = 3r

$= \frac{4}{3}\pi (3r)^3$

$V_2 = \frac{4}{3}\pi r^3 (27)$

$V_2 = V_1 (27)$

27 times

Try: A heavy sphere with diameter 20 cm is dropped into a right circular cylinder with a base radius of 10 cm and a height of 34 cm. A) If the cylinder is half full of water, what is the total volume of the water and the sphere?

You can play this game after you finish your HW

http://cemc2.math.uwaterloo.ca/mathfrog/english/kidz/SAV.shtml

1 ***Assignment:*** ***page 51 Q #3–5, 8, 9, 15 and 16*** *Quiz in 1.4-1.6*